

COORDINATE GEOMETRY

(4 Marks)

$$A(x_1, y_1) \quad B(x_2, y_2)$$

$$A(3, 4)$$

x_1, y_1

$$B(5, 8)$$

x_2, y_2

1 Midpoint = $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$

$$Mid = \left(\frac{3+5}{2}, \frac{4+8}{2} \right) = (4, 6)$$

2 DISTANCE = $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$$D = \sqrt{(5-3)^2 + (8-4)^2}$$

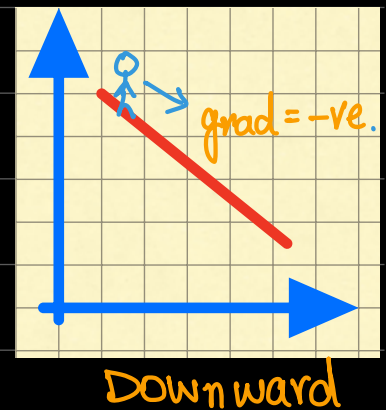
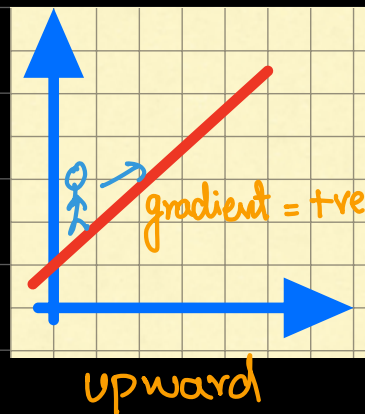
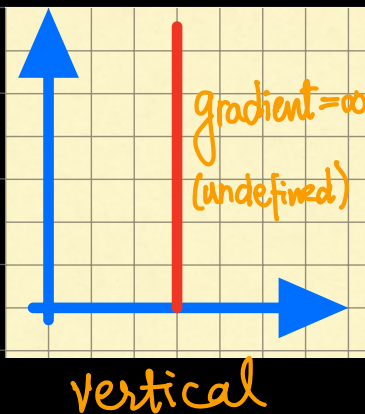
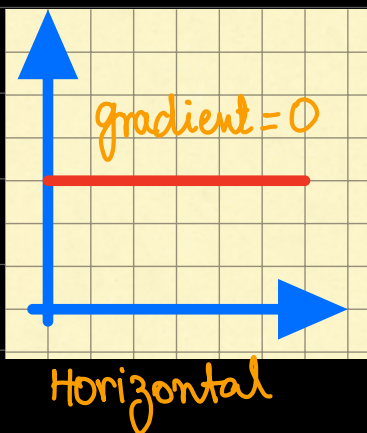
$$= \sqrt{4+16} = \sqrt{20} = \boxed{}$$

3 Gradient = slope = $\frac{y_2 - y_1}{x_2 - x_1}$

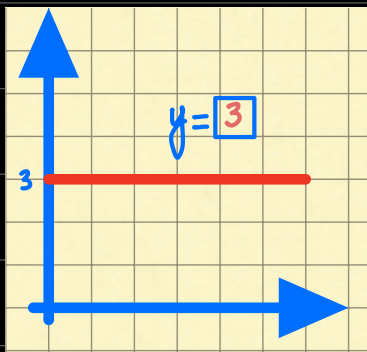
(m)

$$m = \frac{8-4}{5-3} = \frac{4}{2} = 2$$

GRADIENT OF A LINE: *Note: Stick figure always goes left to right.*

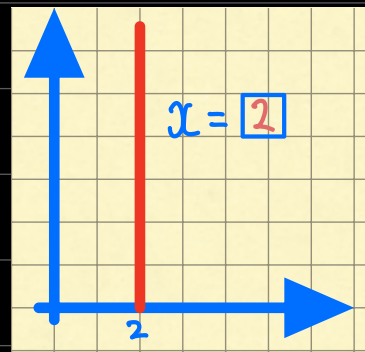


EQUATION OF A LINE



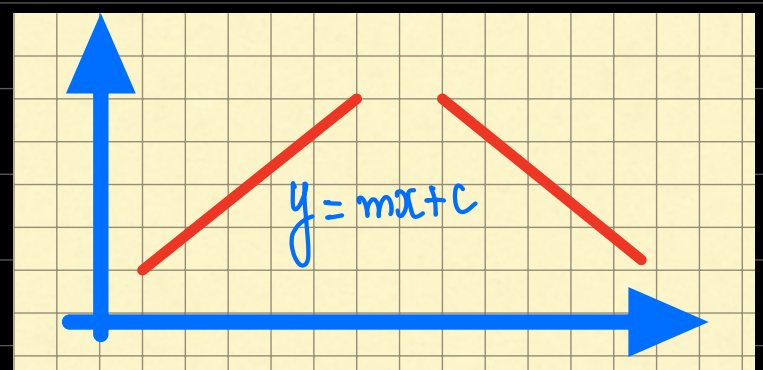
HORIZONTAL

$$y = \boxed{}$$



VERTICAL

$$x = \boxed{}$$



SLANTING LINES.

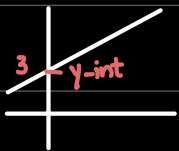
$$y = mx + c$$

EQUATION OF A SLANT LINE

METHOD 1

$$y = mx + c$$

Given: 1) gradient (m)



2) y-intercept (c)
(point where graph cuts y-axis)

Q: Find equation of line that has slope 2 and cuts y-axis at 5.

$m = 2$ $y\text{-int} = c = 5$

$$y = mx + c$$

$y = 2x + 5$

METHOD 2

$$y - y_1 = m(x - x_1)$$

Given: 1) Gradient (m)

2) A point on line (x_1, y_1)

Q: Find equation of line that has slope 3 and passes through point (1, 5).

$m = 3$ $x_1 = 1, y_1 = 5$

$$y - y_1 = m(x - x_1)$$

$$y - 5 = 3(x - 1)$$

$$y - 5 = 3x - 3$$

$$y = 3x - 3 + 5$$

$y = 3x + 2$

Q: Find equation of line which has slope 2 and it passes through (7, 11)

$m = 2$

$$y - y_1 = m(x - x_1)$$

$$y - 11 = 2(x - 7)$$

$$y - 11 = 2x - 14$$

$$y = 2x - 14 + 11$$

$$y = 2x - 3$$

Q: Find equation of line which has slope -2 and it passes through $(3, -1)$.

$$m = -2$$

$$y - y_1 = m(x - x_1)$$

$$y - (-1) = -2(x - 3)$$

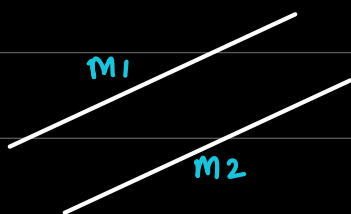
$$y + 1 = -2x + 6$$

$$y = -2x + 6 - 1$$

$$\boxed{y = -2x + 5}$$

NOTES

1 PARALLEL LINES

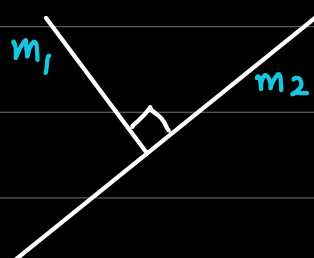


$$\boxed{m_1 = m_2}$$

Parallel lines have same gradients.

Right angle
Perpendicular
Normal.
 90°

2 PERPENDICULAR LINES



1

$$\boxed{m_1 \times m_2 = -1}$$

2

SHORTCUT: NEGATIVE RECIPROCAL

$$m_1 = 3$$



$$m_2 = -\frac{1}{3}$$

$$m_1 = \frac{1}{2} \longrightarrow m_2 = -\frac{2}{1} = -2$$

$$m_1 = -\frac{4}{3} \longrightarrow m_2 = +\frac{3}{4}$$

2 HOW TO TELL GRADIENT OF A LINE FROM ITS EQUATION:

$$3y - 2x = 12$$

$$3y - 2x = 12$$

Step 1: Make y -subject

$$3y = 2x + 12$$

Step 2: Compare with

$$y = \frac{2}{3}x + \frac{12}{3}$$

$$y = mx + c$$

$$y = m x + c$$

$$\text{gradient} = \frac{2}{3}$$

3 IF A POINT LIES ON A LINE, IT MUST SATISFY ITS EQUATION.

Q. Check if $(1, 5)$ lies on $y = 2x + 3$ or not?

$$y = 2x + 3$$

$$5 = 2(1) + 3$$

$$5 = 5$$

Yes $(1, 5)$ lies on $y = 2x + 3$

Q. Given that $(3, k)$ lies on $2y = 3x + 1$ find value of k .

$$2y = 3x + 1$$

$$2(k) = 3(3) + 1$$

$$2k = 10$$

$$k = 5$$

4

IF A POINT LIES ON X-AXIS, PUT $y=0$ IF A POINT LIES ON Y-AXIS, PUT $x=0$

Q: Line $3x + 4y = 12$ cuts x axis at P and it cuts y-axis at Q. Find coordinates of P and Q.

① x-axis (put $y=0$)

$$3x + 4y = 12$$

$$3x + 4(0) = 12$$

$$3x = 12$$

$$x = 4$$

$$P(4, 0)$$

② y-axis (put $x=0$)

$$3x + 4y = 12$$

$$3(0) + 4y = 12$$

$$4y = 12$$

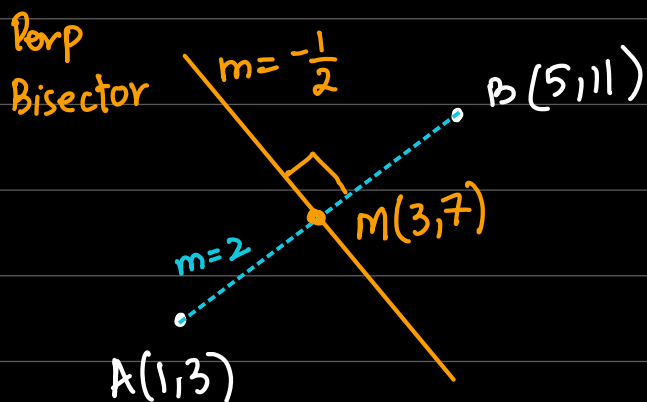
$$y = 3$$

$$Q(0, 3)$$

Divides in two equal parts.

EQUATION OF A PERPENDICULAR BISECTOR (4 Marks)

Q: Find the equation of perpendicular Bisector of A(1, 3) and B(5, 11).



Step 1: Midpoint

$$M\left(\frac{1+5}{2}, \frac{3+11}{2}\right)$$

$$M(3, 7)$$

Step 2: Gradients

$$m_{AB} = \frac{11-3}{5-1} = \frac{8}{4} = 2$$

$$m_{\perp} = -\frac{1}{2}$$

Step 3: Equation

$$m = -\frac{1}{2} \quad m(3, 7)$$

$x_1 \quad y_1$

$$y - y_1 = m(x - x_1)$$

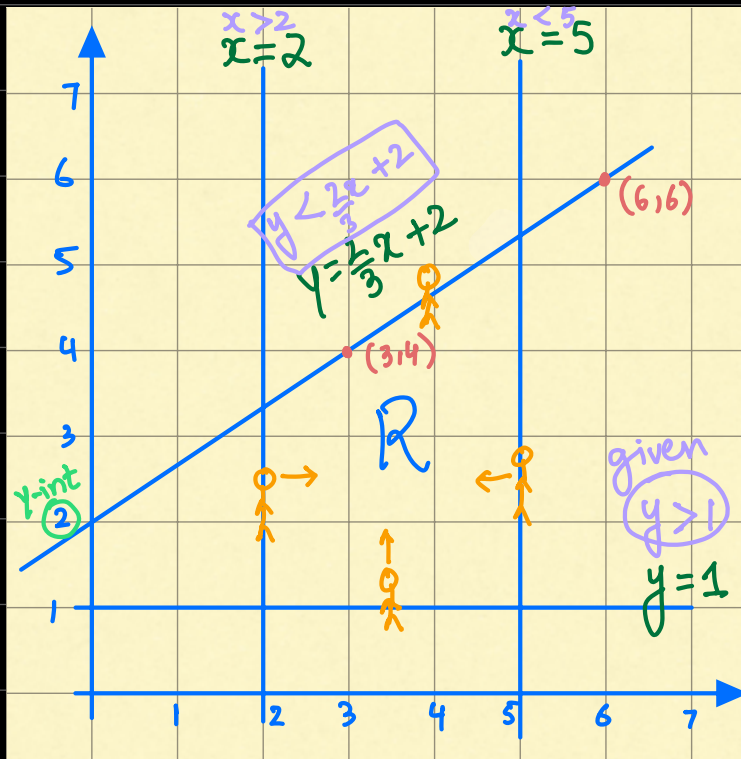
$$y - 7 = -\frac{1}{2}(x - 3)$$

$$2y - 14 = -x + 3$$

$$2y = -x + 17$$

$$y = -\frac{1}{2}x + \frac{17}{2}$$

SHADING INEQUALITIES (2-3 marks)



Region R is enclosed by 4 lines. Write down 3 inequalities that enclose region R. one inequality is $y > 1$.

Ans:
$$\begin{aligned} x &> 2 \\ x &< 5 \\ y &< \frac{2}{3}x + 2 \end{aligned}$$

For slant line:

1) gradient: $\frac{y_2 - y_1}{x_2 - x_1} = \frac{6 - 4}{6 - 3} = \frac{2}{3}$

$(3, 4)$ $(6, 6)$
 x_1, y_1 x_2, y_2

2) y-int (from graph)
 $c = 2$

$$y = mx + c$$

$$y = \frac{2}{3}x + 2$$

STEPS: 1) Find equation of all lines, make y-subject and label on graph.

2) Now decide $>$ or $<$ sign

above line means $>$

below line mean $<$

Exception: For vertical line do not check

above / below:

Right means $>$

Left means $<$